PHYTOTOXICOLOGY SECTION INVESTIGATION IN THE VICINITY OF ETHYL CORPORATION, CORUNNA, ONTARIO AUGUST 23, 1989

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Air Resources Branch
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1 Background

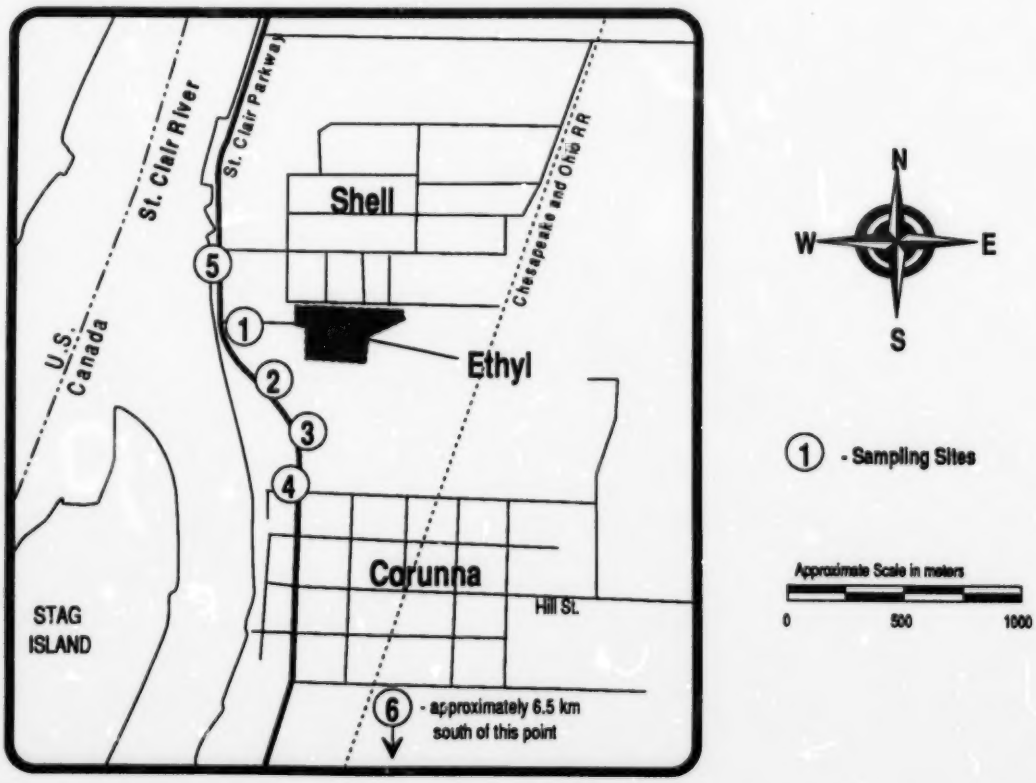
Ethyl Corporation, Corunna is a manufacturer of the gasoline additive tetraethyl lead. Phytotoxicology surveys have been carried out around the company in 1986 (1) and 1987 (2). In both cases these were in response to accidental releases from the company. In 1989 the Sarnia office of the Ministry of Environment requested that a Phytotoxicology survey be carried out in 1989. On August 23, 1989 Randall D. Jones of the Phytotoxicology Section conducted a survey for heavy metal contamination of silver maple foliage in the vicinity of Ethyl Corporation, Corunna. This is a report of the results of that investigation.

2 Methods

Silver maple foliage samples were collected at five sites within 1 km of the Ethyl plant. Silver maple control samples were collected at a location approximately 8.5 km south of the plant (see Figure 1). These are the same six sites sampled in the 1987 survey. The samples where collected using standard Phytotoxicology sampling techniques (3).

All samples were delivered to the Phytotoxicology Section sample processing laboratory in Toronto where they were dried and ground before being submitted to the Inorganic Trace Contaminants Section, Laboratory Services Branch for chemical analysis. The samples were analysed for aluminum, cadmium, chromium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, sodium, strontium, vanadium and zinc.

Figure 1: Approximate Location of the Six Sampling Sites Sampled for Silver Maple Foliage on August 23, 1989



3 Results

The results for aluminum, cadmium, chromium, cobalt, copper, iron, lead and, manganese are given in Table 1. The results for molybdenum, nickel, sodium, strontium, vanadium and zinc are given in Table 2. The results are expressed as µgm/gm dry weight and are the mean of the duplicate samples collected at each site.

Table 1: Results of Chemical Analysis of Silver Maple Foliage for Aluminum, Cadmium, Chromium, Copper, Cobalt, Iron and, Lead Collected in the Vicinity of Ethyl Corporation, Corunna, August 23, 1989

Sampling Site Number	Aluminum	Cadmium	Chromium	Cobalt	Copper	Iron	Lead
1	56	<0.1	<0.5	<0.2	6.6	115	10
2	37	<0.1	<0.5	<0.2	4.3	78	2
3	55	0.1	1.2	<0.2	5.9	135	9
4	63	0.15	0.7	0.25	9.7	160	4
5	67	<0.1	0.7	<0.2	7.2	150	6
6	44	<0.1	0.6	<0.2	10	97	<0.5
Urban Upper Limit of Normal	500	1	8	2	20	1000	60

Table 2: Results of Chemical Analysis of Silver Maple Foliage for Manganese, Molybdenum, Nickel, Sodium, Strontium, Vanadium and Zinc Collected in the Vicinity of Ethyl Corporation, Corunna, August 23, 1989

Sampling Site Number	Manganese	Molybdenum	Nickel	Sodium	Strontium	Vanadium	Zinc
1	42	0.2	0.9	15	23	2.1	41
2	9	<0.2	<0.5	155	26	<0.5	33
3	79	<0.2	0.9	25	16	1.5	35
4	41	0.4	0.5	12	19	0.7	25
5	17	<0.2	0.7	15	20	0.6	33
6	13	0.4	<0.5	9	17	<0.5	33
Urban Upper Limit of Normal	100	1.5	7	350		5	250

4 Discussion

All of the results were below the Urban Upper Limit of Normal for each element. No trends in lead concentration were observed with distance from Ethyl Corporation. The slightly elevated lead concentrations at sampling sites 1, 3 and 5, with respect to the control, were due to the proximity of these sites to the St. Clair Parkway and vehicles burning leaded gasoline. The results were similar to those reported in the previous two surveys.

With the exception of manganese concentrations, none of the other thirteen elements showed discernable trends with distance from Ethyl Corporation. The trend seen in manganese is similar to that for the lead results and may also be due to vehicles burning unleaded gasoline, which may contain manganese as a replacement for lead.

5 Appendices

5.1 References

1. Ministry of the Environment, 1986. A Report on a Phytotoxicology Section Investigation in the Vicinity of Ethyl Corporation, Corunna on August 5, 1986. Phytotoxicology Section - Air Resources Branch, ARB-201-86-PHYTO.

2. Ministry of the Environment, 1988. Phytotoxicology Investigation in the Vicinity of Ethyl Corporation, Corunna, Ontario, June 24, 1987. Phytotoxicology Section - Air Resources Branch, ARB-205-87-PHYTO.
ISSBN: 0-7729-4015-0

3. Ontario Ministry of the Environment, 1983. Field Investigation Manual. Phytotoxicology Section - Air Resources Branch; Technical Support Sections - NE and NW Regions

4. Ontario Ministry of the Environment, 1989. Ontario Ministry of the Environment "Upper Limit of Normal" Contaminant Guidelines for Phytotoxicology Samples. Phytotoxicology Section - Air Resources Branch ARB-138-88-Phyto. ISBN: 0-7729-5143-8

5.2 Derivation and Significance of MOE "Upper Limits of Normal" Contaminant Guidelines

The MOE "upper limits of normal" contaminant guidelines essentially represent the expected maximum concentration of contaminants in surface soil (non-agricultural), foliage (tree and shrub), grass, moss bags and or snow from areas of Ontario not subject to the influence of point sources of emissions. "Urban" guidelines are based upon samples collected from centers of minimum 10,000 population. "Rural" guidelines are based upon samples collected from non-built-up areas. Samples were collected by MOE personnel using standard sampling techniques (4). Chemical analyses were performed by the MOE Laboratory Services Branch.

The guidelines were calculated by taking the arithmetic mean of available analytical data and adding three standard deviations of the mean. For those distributions that are "normal", 99% of all contaminant levels in samples from "background" locations (i.e. not affected by point sources nor agricultural activities) will lie below these upper limits of normal. For those distributions that are non-normal, the calculated upper limits of normal will not actually equal the 99th percentile, but nevertheless they lie within the observed upper range of MOE results for Ontario samples.

Due to the large variability in element concentrations which may be present across Ontario, even in background data, control samples should always be collected. This is particularly important for soils, which may show large regional variations in element composition due to difference in parent material. Species of vegetation which naturally accumulate high levels of an element also may be encountered.

It is stressed that these guidelines do not represent maximum desirable or allowable levels of contaminants. Rather, they serve as levels which, if exceeded, would prompt further investigation on a case by case basis to determine the significance, if any, of the above normal concentration(s). Concentrations which exceed the guidelines are not necessarily toxic to plants, animals or man. Concentrations which are below the guidelines are not known to be toxic.

For more information on the Upper Limits of Normal see reference (4).